

14 Gregory Hall

Urbana, Illinois

Phone 7-6611, Ext. 3394

NAEB ENGINEERING NEWSLETTER No. 2
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Here is Issue No. 2 of the NAEB ENGINEERING NEWSLETTER. We're not quite on the schedule we sought to maintain, but three weeks of travel in April moved our self-imposed deadline back just about that much.

You will notice that we have included considerable material in addition to the Technical Tips columns of the regular monthly Newsletter which goes to all NAEB members. We're happy to publish this material and trust that it may inspire others to contribute to future issues of this publication. Perhaps your idea, or some modification you have made to improve your operation, will prove of value to others in educational radio or television. And if you use any of the ideas we publish, we hope you'll write the contributor and express your appreciation.

Here's another reminder that the deadline for applications for the 1955 TV Engineering Workshop is June 1. This is a fine opportunity for adding to your technical knowledge as well as providing an opportunity to meet others working in educational stations. For more details see page 8.

We hope you'll like this NEWSLETTER as well as the Technical Directory mailed with it.

Cecil S. Bidlack
Cecil S. Bidlack
May 15, 1955

TV TECHNICAL TIPS NO. 6

(March, 1955)

By Cecil S. Bidlack, NAEB TV Engineer

Big news of the month from the Engineering Service was that the first issue of the NAEB ENGINEERING NEWSLETTER went into the mails on February 10. It was sent to all those engineers who returned our Technical Directory cards. If you haven't received your copy, send us your name on a post card and we'll put one in the mail to you. The first issue contained 21 pages and consisted mainly of reprints of the engineering news columns from the regular NAEB Newsletter. We hope to have No. 2 roll from the presses in April, so watch for it.

As we go to press, our Technical Directory list is still growing. Nearly 175 engineering staff members of educational stations, AM, FM, and TV, have returned our directory cards. Soon we plan to publish a Technical Directory—we want it as complete as possible, but we can't dream up a list of names. Some one has to send them to us. So—dear reader, check with your engineers and ask them if they have returned our directory cards. If they haven't, a post card will do.

Carl Menzer, Chairman of the NAEB Engineering Committee, was in Urbana February 21. He and Mrs. Menzer are now on their way to Mexico for a winter vacation. During his stay here, we worked out a tentative program for the 1955 TV Engineering Workshop. A grant has been made by the FAE which makes the Workshop possible. The tentative program has been sent to a number of people for their comments and suggestions. Soon there will be an official announcement of the time, place, and deadline for applications. Watch for it.

Joseph Place, Audio-Visual Director for the Ferguson-Florissant School District of St. Louis County, Missouri, has sent us an article for the next ENGINEERING NEWSLETTER, "A Low Cost Master Antenna System for Television in Schools." In this article he tells how he solved the problem of a master antenna system in two of the schools of his system at low cost. In one school, two antennas serve 19 classrooms at a cost of \$125.00; and in the other, one antenna serves 12 classrooms at a cost of \$75.00. We are making copies of his paper and will be glad to send it to you upon request.

Winston Bugg of WABE in Atlanta is rewriting a couple of items on tape recording for the next ENGINEERING NEWSLETTER. We are also happy to announce that he has been registered as a Professional Engineer in Georgia, and has been elected Vice-Chairman of the Atlanta Section of the IRE. Congratulations!

We are also happy to record that Bob Higgy, Director of WOSU, is back at his desk after a second eye operation. He reports that the weather of the past few weeks has practically stopped work on the new WOSU-TV building. We sent him ordering information on RTMA Resolution Charts and Slides and test films. So you see, things are moving along at WOSU.

Bill Dunbar of General Communications, Fort Atkinson, Wisconsin, stopped by on his way home from a trip south. He left literature on the General Communications line of distribution amplifiers, switching systems, master power supplies and voltage regulators. If you want more information, I have inquiry cards or you can write him direct.

Dage Division of Thompson Products put on a demonstration of their vidicon camera equipment in the TV-MP studios of the University of Illinois, February 25. They are providing a "package" TV station for the Armed Forces with one live vidicon camera, two film projectors, vidicon film chain, 100 watt VHF transmitter and antenna for \$52,000. If the FCC approves, these low power packages might be the answer for school systems in smaller cities with a VHF channel reservation.

Work is progressing on the installation of the WTLC (or as we at NAEB so quaintly call it, WILL-TV) transmitter, and bids have been received for the erection of the antenna on the Illinois Memorial Stadium. Schooley reiterates, "Could be on the air in thirty days."

Joe Belcher of the General Precision Laboratory writes to tell about a new TV Utility Projector Model RA-101C which sells for \$2,350. Joe says it has the basic mechanism from their standard telecine unit but less pedestal, upper magazine, trimmings, etc. Says it's normally delivered with an intermittent usable for color vidicon, or image orthicon use but can be ordered for "ike" chain use. These units can be used as standby equipment, preview, telecine, or small background projection jobs (4' x 6'). Also sound is flat to 7 kc, with better than usual light distribution and 600 line resolution.

The report of the 1954 TV Engineering Workshop is about ready to turn over to Harold Hill and his blue pencil. The printer is now working on the 1954 Production Workshop with page proofing partially complete.

Bob MacDonald and Paul Carlson of Philco's Chicago office stopped here the other day to tell us that Philco is going into production on their new TV Cinescanner. It employs a continuous film transport mechanism operating in conjunction with a flying spot scanner. The scanner is available either for monochrome or color, with the monochrome projector readily convertible to color at some future date, if desired.

FAE GRANT TO KUHT

KUHT, the University of Houston's educational television station, has been awarded a \$34,500 grant by the Fund for Adult Education, General A. D. Bruce, president of the University, has announced. The money will be used for the purchase of kinescope and film equipment Mr. John C. Schwarzwalder, KUHT manager, stated. He said, "This new equipment will enable KUHT to further serve the community and the nation by preserving in permanent form programs of educational value." The University is one of 12 schools in the country receiving this grant. The University of North Carolina is the only other college in the South receiving a similar grant.

Included in the list of equipment to be bought are two studio cameras with 12,000-foot magazines for filming complete 30-minute programs. These can be used either for kinescoping or for straight film production. This equipment will be used to make film recordings of KUHT programs which will be sent to the Educational Television and Radio Center, Ann Arbor, Michigan, for distribution to other educational television stations. A group of such programs from KUHT has already been planned, Mr. Schwarzwalder said. The first of these will be a series of programs on Life Sciences with Dr. H. Burr Roney, associate professor of biology at the University. In addition, KUHT will now be able to kinescope programs for use by area commercial stations or local advertising agencies.

TV Technical Tips No. 7
(April, 1955)
Cecil S. Bidlack, NAEB TV Engineer

Deadline for copy for the April Newsletter passed last week while the NAEB TV Engineer was in New York attending the 1955 IRE Convention. As we write this on our return to the office (March 28), we're not sure whether these engineering notes will be stapled with the rest of the Newsletter or just be mailed in the same envelope. At any rate, we hate to spoil our record and miss an issue of the Newsletter even though the "vital" information given in this column might not be missed. So if this seems like an afterthought, it's just that this month the deadline meant just that, especially since "Roz" Biason was leaving us for the Far East on the deadline date. This column wishes her a good trip, the best of luck and happiness in her new position.

It isn't exactly news, but the announcement of the 1955 TV Engineering Workshop was mailed March 15. We hope we missed no one who would be interested in attending this year. Just as a reminder, the date is September 12-16 and the place is WKAR-TV in East Lansing, Michigan. If you didn't see the announcement of the Workshop, drop us a card at NAEB Headquarters and we'll see that you receive a copy.

Speaking of the Workshop, our trip to the IRE Convention provided an opportunity to discuss the program of the Workshop informally with representatives of equipment manufacturers. To date, all we have talked with have assured us of their willingness to cooperate in the 1955 TV Engineering Workshop and we expect that others will express the same willingness when contacted. Details of the program are yet to be worked out, but from the response so far, we feel that a very full and worthwhile program will result.

At the Institute of Radio Engineers Convention some fifty-five sessions were held, at each of which some four or five papers were presented. Exact number in attendance is not available although some 40,000 were expected to attend. Within the membership of IRE, there is a subdivision according to major interest, of 23 professional groups ranging from Aeronautical Electronics to Vehicular Communications. Consequently at the Convention there are papers presented of interest to everyone, even to a symposium on electronic controlled space stations. Of interest to broadcast and television engineers were those sessions on video tape recording, and color television as well as one paper on a tricolor vidicon experimental camera tube for color television.

There were 704 exhibits which filled the Kingsbridge Armory and overflowed into the Kingsbridge Palace nearby. All available Convention papers will be published in the 1955 Convention Record. The Convention record is published in ten parts according to subject, and will be available in June, 1955. For further information write The Institute of Radio Engineers, 1 East 79th Street, New York 21, N. Y.

John Klindworth, Field Engineer of the Allen B. DuMont Laboratories stopped during the month. He reported 47 DuMont Multi-Scanners in use and this morning's mail brought a card announcing installation of #49. This office has available a

paper covering technical details on this scanner which will be sent upon request. If you wish further information on the DuMont line we'd suggest you write direct for their catalog or their color planning packet which is also available.

The State University of Iowa is conducting a "Short Course" on color television to be held on April 15 and 16. Attendance is expected to be around fifty, composed of chief engineers and production managers of nearby TV stations, TV repairmen, students and faculty of the University. The announcement reached us last week, too late for us to make plans to attend. Looks like an interesting and informative program. Professor Edward M. Lonsdale of SUI's E. E. Department is Chairman of the conference.

We'd like also to mention the General Precision Laboratory Model PB-610TV Projection system which was demonstrated at the TV Engineering workshop last October. It projects a picture up to 9 x 12 feet in size, is wheel mounted for mobility, and was designed for group viewing in schools, hotels and industrial organizations. It can be used either for closed circuit programming with studio or industrial cameras or for viewing "off the air" broadcasts by the use of the TV receiver incorporated in the unit. Systems of this type should be of great value to educational institutions especially in medical or dental schools. The most minute details of surgical operations can be picked up on a TV camera and fed to almost unlimited numbers of viewers located in local or remote auditoriums. Industrial plants too can demonstrate complex machine shop operations to large groups of personnel concerned.

For more complete information, including price, write to General Precision Laboratory, Pleasantville, New York.

We had a recent request from M. McCabe Day, Director of the Audio-Visual Center, Station WVSH, Huntington, Indiana, asking for information to enable them to build a 250 watt amplifier for their 10 watt FM transmitter. Lacking this we told him of two stations with 250 watt FM transmitters for sale. Perhaps one of our readers has the information he wants or has equipment for sale. If so, we're sure he'd be interested in hearing from you.

March 8 and 9 we spent at the TV Laboratory, State University of Iowa at Iowa City. We met the entire staff, observed their operation and reported these observations back to them. We hope that our recommendations and suggestions will prove of value to them.

They are conducting an experiment at the TV laboratory in Iowa City to study the effectiveness of the discussion method of teaching when transmitted from one room to others by means of television. Dean Dewey B. Stuit of the College of Liberal Arts is in general charge of the project and the class meets in the TV Studio. But since we're already late we'll give all the details in the May Newsletter.

TV Technical Tips No. 8

May, 1955

Cecil S. Bidlack, NAEB TV Engineer

Perhaps public school officials and educational institutions should take a second and more exhaustive look at the proposal of the Federal Communications Commission (Docket 11237) on low power television stations. This would permit authorization of stations with a minimum effective radiated power of 100 watts in cities of less than 50,000 population without regard to antenna height above average terrain. For a practical application of low power television broadcasting, they can also benefit from the experience of the new Armed Forces Television Service, which has recently been in the trade news of the TV industry.

Attention of NAEB headquarters was focused on the Armed Forces Television Service by a report from Professor W. W. Smith of WMUA and the University of Massachusetts at Amherst, Mass. His report describes, in some detail, the low power station at Loring Air Force Base at Limestone, Maine. Other information was secured by the writer at the recent SMPTE Convention in Chicago where a paper was presented by Major Stanley E. Rodby, of the Office of Armed Forces Information and Education in Washington, on "Low Power Telecasting by the Armed Forces."

The Limestone, Maine station was the first and pilot model of these stations. Its equipment consisted of a single vidicon camera and control, a film projector, slide projector, multiplexer, sync generator and necessary power supplies, monitors, speech input equipment including microphones and turntables, a ten-watt transmitter and antenna. RCA provided equipment for the initial station. The complete station, including remodeling of the studio, transmitter, installation and even two weeks of training for personnel cost less than \$50,000.

The bulk of the programming is done by the use of kinescope recordings loaned to the station by commercial sponsors and agencies. No attempt is made to delete the commercials. For live programming such as news, weather and other rather static type programs, the vidicon camera was simply swung around 180 degrees on its mount and trained on the announcer or speaker in an 8 x 12 foot lighted booth.

It must be remembered that Limestone, Maine and other Armed Forces Stations are in remote areas, not serviced by any television station. While the live picture quality of the vidicon camera left much to be desired, still the military personnel and their families living on these remote bases received a tremendous lift in morale with the advent of the TV station.

The Armed Forces have stations on the air also in the Azores, North Africa and Iceland. For these and other stations, equipment has been supplied by RCA, Dage (with Gates) and Electronics Research Laboratory. Technicians and other station personnel are selected from qualified personnel on each post. Receivers are purchased thru the Post Exchange for barracks, day rooms, officers' quarters and the homes of service men's families. The AFTS already has some 60,000 viewers for whom TV is the main form of recreation and entertainment. New stations will be installed at Thule, Greenland and Saudi Arabia, with plans for other stations in Greenland, Okinawa, Bermuda and Puerto Rico. So far all stations have been on VHF Channel 8 but the Puerto Rico station may be UHF to avoid possible interference problems.

What we are attempting to do is to draw attention to the fact that for small cities low power transmitters may be the answer for local coverage for educational and community stations. We do not believe that adequate live picture quality can be obtained from present day vidicon cameras to compete with image orthicon camera pictures. Consequently we do not recommend the entire "package" for educational use. A number of commercial stations have tried to use vidicon cameras for live studio use but almost without exception have changed to image orthicons. Even the Limestone, Maine AFTS station now uses image orthicon cameras for live pictures.

However the use of a low power transmitter with a small and inexpensive tower may cut equipment costs in half and allow many more communities to have television service. As this is written we have on hand brochures from the Dage Television Division, Thompson Product Inc. which give complete equipment lists and prices for low power TV stations for various types of operation. We also have a brochure from Adler Communications Laboratories, New Rochelle, New York which describes their line of low power television transmitting equipment listing many possible combinations of equipment and prices. No doubt there are others in the field with similar equipment available.

In last month's column we promised a more detailed account of the teaching experiment now being conducted in the TV Laboratory, State University of Iowa at Iowa City. They are attempting to determine the effectiveness of the discussion method of teaching by using television transmission from one room to another. The course material is Political Science 304, Comparative Foreign Governments, which is taught by Professors Kelso and Whitesel. The experiment is being directed by Professor H. Clay Harshbarger and Dr. Sam Becker. Technical setup was arranged by Clarence D. Phillips and Robert Stumme.

In this study the members of one section or group will be situated around a table and will be taught by the discussion method. Students in another room will see the first group in action on a television screen and will listen to the discussion. In addition the watching group will be able to communicate with the discussion group by means of an inter-communication system. The hypothesis is that the use of the inter-com system will keep the second group in a participant instead of just an observer role. The constituency of the two groups will be "rotated" during the semester so every student will be a member of each group.

The study is concerned primarily with discovering what problems are involved in this type of teaching. It is believed, however, that television does possess inherent characteristics which will permit the use of the discussion method in teaching two or more groups simultaneously, yet preserve some of the unique features of the small group situation. There would seem to be little question that television can be very effective when the lecture method of teaching is used; because this simply involves the transmission of picture and sound to several different locations - locations which may be only a few feet away or many miles away. The study being undertaken at Iowa City is particularly significant in that it will attempt to study the use of television with the small-group-discussion situation being preserved.

During the course of the semester, particular attention is being given to the preparation of the most appropriate types of material, use of visual aids, methods

of stimulating and guiding discussion and the discovery of the most effective camera and microphone techniques. Student reaction to the experiment is very favorable. Some lament, "Televising the group keeps us on our toes, we don't dare come to class without adequate preparation."

RCA has announced a new high quality, three speed turntable for radio and television broadcasters, the Type EQ-2A. It is priced complete with cabinet at \$398. All standard types of broadcast tone arm assemblies may be easily mounted on the cabinet and, if desired, two tone arms for various types of pick-ups can be accommodated. The new design has a simplified speed changing mechanism with a minimum of moving parts with self compensating neoprene idlers.

We also recently received a new RCA catalog on Broadcast Test and Measuring Equipment for AM-FM and Television.

April was travel month at NAEB Headquarters. Bidlack spent April 4 and 5 at Nela Park in Cleveland at a GE Lighting Conference. A more complete report on this will come later when the papers presented are available. We tried to promote invitations to this conference for all educational TV stations but have no way of knowing how successful we were. The conference was held in two sections April 4 and 5 and the same program was repeated on April 6 and 7. At the April 4 and 5 sessions, Carleton Musson and Robert Irwin of WKAR-TV were there, as well as Albert Hrivnak and Thomas Martin of WBOE in Cleveland and Herbert Seltz of Indiana University. Other educational station representatives may have been present at the Wednesday and Thursday sessions which we did not attend. Invitations to this conference were issued thru the Lamp Sales District offices of General Electric. If you didn't receive an invitation to attend, you might ask your GE lamp salesman about it.

April 6 and 7, your TV Engineer was in New York representing NAEB at the Film Council of America meeting. Dr. Skornia, NAEB Executive Director spent the evening of April 6 in Pittsburgh visiting WQED and at noon on April 7, he met the writer at La Guardia and we attended the NAEB Region I meeting in Amherst, Massachusetts. This meeting is covered elsewhere in the NEWSLETTER.

Our paths parted in Amherst with Dr. Skornia going to Boston to visit WGBH-TV and Bidlack returning to Cleveland. On Monday, April 11, Bidlack visited W. B. Louis at WBOE and talked over their television plans. Monday evening Dr. Skornia and Bidlack reached Columbus for the Institute for Education by Radio-Television and Tuesday morning Harold Hill, NAEB Associate Director, and John Holt, NAEB Network Manager, arrived.

On Monday April 18 following the Institute, everyone was back at Headquarters but April 20 and 21 Bidlack spent in Chicago at the SMPTE Convention returning to the office Friday morning to pass Dr. Skornia and NAEB President Frank Schooley on their way to Chicago for a meeting with G. H. Griffiths of the Fund for Adult Education.

One of the most interesting papers and demonstrations at the recent SMPTE Convention was given by George Colburn of the George W. Colburn Laboratory, Inc. of Chicago on "Experimental Considerations for 8mm Kinescope Recording." Sounds crazy, you say? That's what most everyone thought until Mr. Colburn demonstrated by showing one of his kines and everyone marvelled at the results.

Mr. Colburn photographed the pictured on an ordinary home receiver without modifications. He built a special camera operated at 15 frames per second which contained an optical viewfinder. By looking through the viewfinder, film and camera lens at the TV screen, he was able to hand rotate the driving motor field so as to eliminate shutter bar. Sound was picked up on a mike set in front of the TV receiver speaker and recorded on a "home" type tape recorder at 3 3/4 inches per second. To get sound on film, Mr. Colburn played the tape back on his recorder, picked it up on another microphone and recorded it upon a magnetic stripe on the 8 mm film.

The results were amazing, I've seen many 16 mm kines with much poorer picture quality and in spite of the roundabout sound pickup through two loudspeakers, it was surprising. The paper was presented in a very charming and droll manner with the Mr. Colburn's prize line being- "Here is truly a "low-fi" Kinescope recording."

One of the features of this years Institute for Education By Radio-Television was the presentation of diplomas to those who had attended the first Institute in 1930 and who had demonstrated continued interest in educational broadcasting. Of the nine persons who were present to receive their diplomas as "Ohio Institute Pioneers" three were engineers; Carl Menzer, Director of WSUI; Bob Higgy, Director of WOSU, and Cec Bidlack, NAEB TV Engineer.

Our only regret is this percentage of representation of engineers could not be maintained for the Institute and also for the NAEB Convention as well. As a matter of fact, with the exception of equipment representatives, we were probably the only engineers attending the Institute. True, there were no technical sessions listed on the program, however many of the sessions held interest for technical personnel. Engineers need to get away from their routine occasionally to broaden their outlook and to meet others in the field outside the confines of their own establishment. We know that travel funds at educational stations and institutions are limited yet we feel that more should be done by management to encourage technical personnel to make an occasional trip. We'd like to see more engineers at the Institute, the NAEB Convention or at technical societies conventions such as the IRE, SMPTE or AES. There, they will meet fellow engineers, share and discuss their mutual technical problems, as well as keep up with the progress of the art by hearing the technical papers presented.

While we're on the topic of trips for technical personnel, why don't you station directors or managers reading this encourage your technical personnel to apply to attend the 1955 NAEB TV Engineering Workshop to be held at WKAR-TV, East Lansing, Michigan, September 12-16. This will not cost your institution anything except the time the engineer is away from his work. All travel expense will be paid as well as \$40.00 which will more than cover meals and lodging while there. The benefits to be gained are many and include the increase in technical knowledge

as a result of the workshop sessions, plus what probably is equally important, meeting and getting acquainted with other engineers and discussing their mutual problems. If you want another notice of the 1955 TV Engineering Workshop telling how to apply, write to me at 14 Gregory Hall, Urbana, Illinois and you'll receive one by return mail. Remember the deadline for applications is June 1, 1955.

Herb Evans, Chief Engineer of WTHS, the FM station of the Board of Public Instruction of Dade County (Miami) Florida, sends along an idea that should be of interest to many school systems.

The Dade County school system is ready to request bids on approximately 120 fixed-frequency fm receivers for WTHS reception. These are essentially quality FM tuners plus a 20 kc "alarm channel" which responds only to 20 kc modulation, not unlike storecasting. Upon receipt of 20 kc modulation of proper duration, a receiver--even if previously silent--will sound a self-contained alarm bell. Once actuated, the bell will continue to ring until school personnel respond by pressing a button. At this time the bell will cease ringing and the receiver audio will become alive.

The main idea of these receivers is to provide a civil defense alerting system under school system jurisdiction. A secondary function is to provide a calling system by which messages may be sent almost instantly to the entire school system. Present practise, by telephone, takes more than a day. Further the set audio may be operated at any time if WTHS is to be monitored.

Mr. Evans developed the circuits for this receiver after a year of experimentation and test. A pilot model is now in operation at the station. The receiver will be completely enclosed with two push buttons the only accessible controls. Thirteen tubes and other controls are accessible only to service personnel. AC power for the receiver is applied and shut off each day by the automatic class-bell program clock which employs a punched paper tape. The cost of each receiver is expected to be in the neighborhood of \$120.00 when the contract is awarded.

April 28, the second station of the Alabama Educational Television Commission, WBHQ, went on the air on Channel 10 in Birmingham. This is the 13th non-commercial educational television station on the air. The opening program ceremonies were also telecast by WTIQ, Munford Channel 7 and by commercial WBRC-TV, Birmingham. George B. Storer officially presented the station a 5 kw RCA transmitter, 6-bay antenna and other station equipment formerly used by WBRC-TV. The Munford station WTIQ went on the air last November, and a third station WAIQ in Andalusia, Channel 2, is planned for September. The Alabama Educational Network has studios in Birmingham, Tuscaloosa and Auburn connected by microwave.

A "Pop" Eliminator*

One of the virtues of tape recording lies in the opportunity to stop the recording at any point for the correction of errors or other editing. However, upon stopping or restarting, it may occur that a "pop" is recorded. This is particularly true of the popular Magne recorder. Magne cord engineers suggest that .01 mfd. condensers across the motor switches will eliminate the trouble when stopping, but these do not help when starting.

Bob Parris, WABE engineer, observed that at the instant of starting the level indicator would fluctuate considerably, and deduced that this is caused by the sudden drain on the power supply by the erase-bias oscillator. If the oscillator could be started a bit before the tape began to move, this transient would be confined to the area of the recording head groove--or to one-half cycle at the highest playback frequency.

Mr. Parris' solution is simple. A microswitch with a leaf spring actuator is mounted on a suitable metal bracket at the rear of the tape transport mechanism in such a position that it is operated by the shaft of the safety button extending through the rear of the chassis. The normally open contacts of the switch are connected in series with the oscillator power supply, across the lowest two terminals on the connector strip--marked 1 and 2 in the Magne cord instruction booklet.

In operation, with the selector switch in "Record" position, the safety button is pushed and held down for about two seconds, and then the control knob is moved to "Forward" position. It's as simple as that, and foolproof.

This same feature is useful in erasing to a very precise point on the tape, as is often necessary in editing. The point at which erasing is to begin is marked, and then the tape is rethreaded so that it passes over the erase head but under the playback head. With the selector set on "Record" and with the tape positioned exactly over the erase head, depress the safety button and move the tape by hand or by the motor for any desired distance. Erasure is complete, very clean, and can be started and stopped at exact points.

Finally, it is suggested that whenever the selector control is moved from "Listen" to "Record" a slow positive movement will prevent some noise which may occur with fast or jerky operation.

*Please note that the title has no biological significance.

NAEB Headquarters
14 Gregory Hall
Urbana, Illinois

An Experiment in Low-cost, Low-power Television

By W. Worcester Smith*

The Engineering Committee of the Western Massachusetts Educational Television Council has received various reports of experiments carried out by the Armed Forces in low power television broadcasting in isolated outposts. One of these is located in Limestone, Maine, and another in the Azores. Eventually these may spread to the far corners of the world. Some of the reports sounded exciting and others contradictory. Through the kindness of Dr. Harry Lyle of the Massachusetts Board of Educational Television, and Mr. E. G. Sherburne of WGBH-TV, the writer was able to talk with Major Peter O. E. Bekker of the U. S. Air Force, who is in charge of the project in Maine. It is hoped that this report will clear up some of the misconceptions and show how Major Bekker's work will assist educational broadcasters.

The U. S. Air Force is operating a low-power television transmitter at the Loring Air Force Base in Limestone, Maine. In sharp contrast to the conventional television stations that have an effective radiated power of nearly a quarter of a million watts, this station has a ten watt transmitter and loses more than half of this in a long transmission line so that only four watts are actually radiated. This is about one-ninth the power of one automobile headlight. Despite the low power, the station has "fans" thirty to forty miles away. The nearest commercial station is in Bangor, 150 air miles away, and the nearest station on the same channel (VHF Channel 8) is on the summit of Mt. Washington, almost 225 miles away.

It is important to keep in mind that this station operates on one of the unused commercial channels that was set aside by the F.C.C. to serve the area. If a commercial station were to apply for a license for this location, the Air Force station would have to go off the air. There is nothing in this experiment that indicates that the F.C.C. would authorize the addition of a low-power educational television station in a state like Massachusetts where no VHF channels are going begging. On the other hand, in more sparsely settled parts of the country there may be channels, so far unclaimed, that could offer a valuable service for a very modest expenditure.

Limestone, Maine, is located on the Canadian border in the northeast corner of that portion of Maine that projects up in between the provinces of New Brunswick and Quebec. Caribou, ten miles away, is the nearest large town. Its population is 10,000. Presque Isle, which is double this distance, has a population of 11,000. It was chosen for this experiment because it is so far away from other television stations that the conditions would be similar to those found in air force bases outside the continental United States, and yet close enough to major centers, such as Boston and New York, that supply and maintenance problems during the year's trial phase would not prevent the completion of the project. Experience has shown that service men and their families, living in remote bases, miss the television programs they had at home. The tiny transmitter at Limestone has proved to be a powerful influence in sustaining the morale at the air base. It has also been a boon to the civilians in the surrounding communities.

This experiment offers great promise to those interested in educational television in places where VHF channels are available because the initial cost is low and the operating budget is minimum. The original studio was only eight by twelve feet. A clever arrangement whereby a low priced (vidicon) camera could be swung to shoot "live" broadcasts through the glass window of the studio, or to a film or

slide projector in the control room, greatly reduced the initial cost. (See appendix for details). Antenna costs were kept at a minimum by mounting a special antenna, designed by RCA, directly on the roof of the penthouse above the base hospital. Since the hospital is located on the highest ground on the base, it was considered sufficient height for the purpose. With this arrangement, the antenna cable was, at the most, 40 feet long and the antenna was radiating an effective power of approximately eight to nine watts from the ten-watt transmitter. The complete station, including remodeling of the studio, transmitter, installation, and even two weeks of training for the personnel, cost less than \$50,000.

The bulk of the programming is done by the use of "kinescope recordings" that are loaned to the station by the commercial networks. No attempt is made to delete the commercials. These kinescope films will be rotated from one station to another as the network grows. There is a time delay involved and the Limestone station was broadcasting the New Year's shows while a few hundred miles south the programs were concerned with Valentine sentiments. There appears to be no reason to doubt that a similar operation could be carried on successfully by an isolated educational station with the bulk of the programming being supplied by the kinescope center at Ann Arbor.

After a trial period of one year, the station was moved to more spacious quarters in a converted barracks building where the studio is eighteen by thirty feet and ample room is available for the transmitter, control room, and other facilities needed for the broadcasting of films and slides. Nine people devote their full time to the operation of the station which broadcasts seven days a week from noon to midnight. Special broadcasts are made outside these regular hours that are of interest only to the Air Force personnel. Two professional type image orthicon cameras were added to the original vidicon camera and all "live" pickups are done with these. The vidicon is now used exclusively for films and slides in connection with a multiplexer unit, a job for which it is admirably suited. A mast was erected which raised the antenna to 232 feet above the ground but the long transmission line reduced the actual radiated power to about four watts. The performance of this installation was described in the second paragraph of this report.

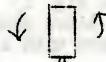
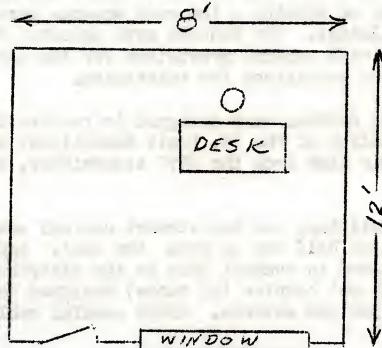
An operation of this sort on a UHF channel would probably be more expensive initially than on VHF unless some manufacturer produces a low-power, low-cost UHF transmitter. For a locality where a channel is available, and an absolute minimum of live programming would be satisfactory for a start, this experiment at Limestone offers great promise. The writer is fortunate in having received an invitation to visit the Limestone station soon, for there are indications that some of the clever techniques developed there will be of interest not only to low-power stations but to educational broadcasters with more sophisticated facilities. Another report will follow this telling what he finds of interest there.

W. Worcester Smith
Chairman of the Engineering Committee
Western Mass. Educational TV Council, Inc.

*A report to the Western Massachusetts Educational TV Council, Inc. and the National Association of Educational Broadcasters.

APPENDIX

Method of Multiplexing Vidicon Camera in Original Small Studio



Vidicon camera mounted on rotatable pedestal.



Multiplexer unit (Dage)



Slide projector 35 mm

Vidicon camera is mounted on turn-table with lock to position it in alignment with film chain. When lock is released the camera can be pivoted 180° to face studio and shoot live shows through the window. Camera can be panned horizontally two or three feet on either side of desk, depending upon the distance from the desk to the camera. Vertical panning is accomplished by adjusting the electronic centering of the vidicon raster. For film and slide presentation the output of the appropriate projector is focused on a field lens upon which the camera is pre-focused.

NAEB Headquarters
14 Gregory Hall
Urbana, Illinois

A Low Cost Master Antenna System for Television in Schools

By Joseph C. Place*

In October 1954, the Ferguson-Florissant School District installed master antenna systems in two of its elementary schools. These two installations were experimental for the purpose of finding a low cost antenna system that might be installed in all school buildings. Two schools were selected for the test; 1) a new 12-room elementary school with conduit provisions for the master network and 2) an older building which had no provisions for television.

Primarily the antenna systems were designed to receive KETC on Channel 9, the educational television station of the St. Louis Educational Television Commission. One school was 14 miles air line from the KETC transmitter, the other was 10 miles air line.

In the new 12-room building, one ten element conical antenna (lazy X) was installed on the chimney stack half way up from the roof. Approximately 35 feet of flat 300 ohm lead in was used to connect this to the distribution box. This was a Brach Mul-Tel No. 300-72 4 set coupler (no tubes) designed to provide four 72 ohm coaxial outputs from one 300 ohm antenna. RG59U coaxial cable was used for distribution.

One 72 ohm coaxial line (RG59U) approximately 225 feet long connected the distribution box to six classrooms, (See Fig. 1) all rooms connected in parallel. Each of the second and third coaxial lines connect the distribution box to three classrooms. Each classroom is equipped with a wall plate containing a 72 ohm connector.

In the older building, there are nineteen classrooms on three floors. Due to the arrangement of rooms, two ten element conical (lazy X) antennas were strategically placed on the roof to give shortest distribution to the classrooms. One antenna served thirteen classrooms and the other six classrooms. Distribution boxes for both antennas were located in the attic. Again 300 ohm flat twin lead was used from these antennas to distribution boxes.

The antenna serving the thirteen classrooms was connected to two distribution boxes providing seven 72 ohm lines to classrooms. (See Fig. 2) Three of the lines had two classrooms paralleled on each line. One line had three rooms connected in parallel and the other line had four rooms connected in parallel.

The second antenna, serving six classrooms was connected to a distribution box providing for four 72 ohm lines. Two lines from this box served the six classrooms, with each line having three classrooms in parallel. (See Fig. 3)

The longest run in the nineteen room installation was approximately 150 feet; the shortest approximately 50 feet. Due to the lack of conduit for the installation of the distribution system and due to the fact that the cable would be within the reach of small children, this cable was housed in wire mold. Each classroom was provided with a 72 ohm wall plate connector.

Each floor of the buildings is provided with one 21 inch table model television set mounted on a roller table 36 inches in height. The sets are equipped with antenna connectors to match the wall plates in each room. The sets were rolled from room to room as needed. The classroom receivers were not equipped with 300 to 72 ohm matching transformers; instead the 72 ohm line was connected through the outlet boxes to the receivers. It was found by experimentation with various matching transformers that their use caused too great a loss of signal strength. The reception on Channel 9 was better without the transformer; however there was no noticeable change in reception on Channel 4 or 5 with or without the transformer. As a result they were not used.

Rooms connected in parallel were not necessarily on the same floor, some lines had a room on each of three floors. As many as three receivers were operated in parallel and in different combinations with no interference and equal picture quality in each room. This is not in accord with theory; however the antenna and distribution system provide good interference free reception with equal picture quality in each room.

The cost of the material used in the systems was as follows:

12-room building	\$ 75.00
19-room building	125.00

The installation was made by the author with the cooperation of a local television dealer, who provided technical information and materials at a special school discount.

The above antenna and distribution system may not be suitable for use in all instances; however in St. Louis it has been found to give very good performance at a cost within reach of most school budgets.

*Director, Audio-Visual Department
Ferguson-Florissant School District
St. Louis County, Missouri

May 3, 1955

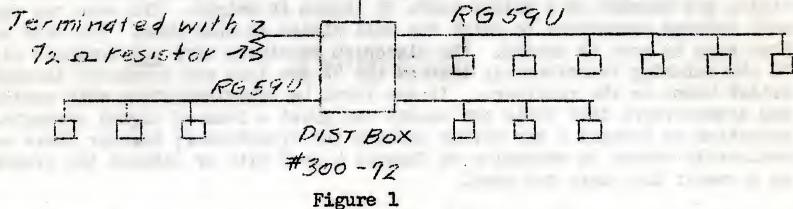


Figure 1

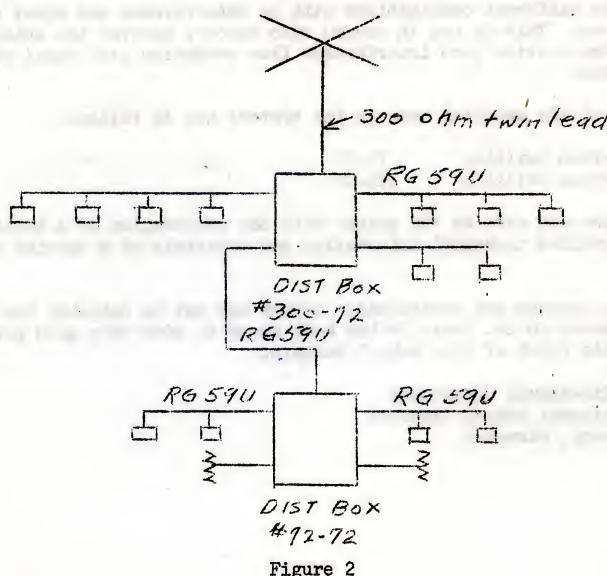


Figure 2

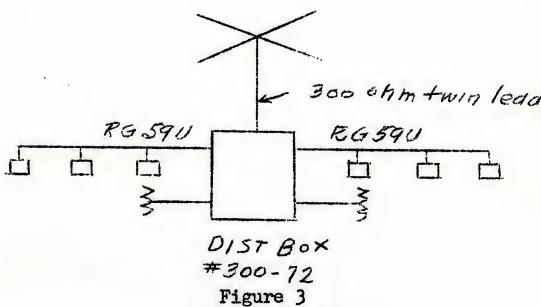


Figure 3

Scanned from the National Association of Educational Broadcasters Records
at the Wisconsin Historical Society as part of
"Unlocking the Airwaves: Revitalizing an Early Public and Educational Radio Collection."



A collaboration among the Maryland Institute for Technology in the Humanities,
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